Remarks

The courtesy of an interview with Examiner Turk on December 2, 2008, is gratefully acknowledged.

Claims 1, 12, 16 and 25 have been amended. Claims 2, 4, 10, 11, 14, 15, 17, 23, and 24 have been canceled.

Referring to Claim 1, the limitations that the treatment channel includes a first and second outlet, the first outlet being in fluid communication with the liquid sample stream, the second outlet being in fluid communication with the carrier liquid stream, and the detector being in fluid communication with the treatment channel first outlet but not with treatment channel second outlet are supported by the specification as follows. At page 9, the apparatus of the present invention is described as a suppressor in an ion chromatography system. Thus the treatment chamber is described as removing the matrix ion species in the aqueous liquid stream so that the aqueous liquid stream leaving the treatment chamber is suppressed. At page 9, lines 13-16, the specification states that the analyte ion species may be detected by any suitable detector used for chromatography application, including a conductivity detector. It further states, "A fluid conduit transports the sample stream but not the carrier liquid stream from the treatment chamber to the detector."

The apparatus is amplified in Example 7 and original Figure 9A (now Figure 8A, included in the amendment filed April 9, 2008). As illustrated in current Figure 8A, the apparatus includes an aqueous phase OUT (outlet) at the bottom of Figure 8A and an organic-phase OUT (outlet) at the top. The horizontal dotted line in the treatment chamber represents the interface between the organic phase (the carrier liquid) and the aqueous phase (the liquid sample stream). The structure of the apparatus illustrated in current Figure 8A is described in Example 7. In the paragraph bridging pages 40 and 41, the detector assembly is stated to be placed in the exit of the channel used for the aqueous eluent phase (the sample liquid stream). Thus, the specification and Figure 8A describe a fluid conduit which provides fluid communication between the treatment channel first outlet and the detector for the sample stream, but not the carrier liquid stream.

The amendments to Claims 12, 16, and 25 are supported by the claims as filed.

Claims 23 and 24 were rejected under 35 U.S.C. 112, second paragraph. In order to expedite prosecution, claims 23 and 24 have been canceled.

Claims 1, 2, 4-9, 12-21, and 23, 24, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Yager (5,971,158). Yager discloses diffusion of analyte particles from a sample stream to an extraction stream for detection of the diffused sample particles in the extraction stream. The objective of Yager is to remove analyte from the sample stream into the carrier stream. The purpose of removing the analyte particles is to isolate them from the surrounding contaminant materials in the sample stream by transporting sample into the carrier stream. One application disclosed by Yager is for detecting urea by transporting the urea from blood into the carrier stream and detecting the urea in the carrier stream. (See col. 18, ll. 53-57.) There is no suggestion in Yager of passing the sample stream through a detector or for detecting any component while in that stream. Thus, Yager teaches away from the present invention. The stated objective of Yager is that once the analyte is removed from the sample stream into the carrier stream, Yager's analyte is free of the remaining large-particle contaminants in the sample stream which could interfere with detection of the analyte ions. If Yager intended to detect analyte ions in the sample stream, there would be no reason to use the Yager liquid-liquid interface to isolate the analyte ions from other components in the sample stream by transport to the carrier stream.

Claim 1, as amended, recites an apparatus for treating a liquid sample stream, including at least one analyte ion species and matrix ion species of opposite charge and for detecting the at least one analyte. The liquid sample stream is in fluid communication with the treatment channel inlet and with a first outlet. The carrier liquid stream is in communication with the treatment channel inlet and with a second outlet. The apparatus further includes a detector for the at least one analyte ion species in the sample stream and a fluid conduit providing fluid communication between the treatment channel first outlet, but not the treatment channel second outlet and the detector. Thus, the sample stream, but not the carrier stream flows to the detector. This is in marked contrast to Yager, in which the analyte diffuses into the carrier stream which flows to the detector. There is no detection of the sample stream. The objective of Yager is to analyze the analytes in the carrier stream free of the contaminants in the sample stream, which are not detected. Thus, as set forth above, Yager teaches away from the apparatus of claim 1, in which the fluid conduit permits flow of the sample stream, but not the carrier stream, to the detector.

Claim 3 recites the apparatus of claim 1 further comprising a chromatography separator in fluid communication with the treatment channel inlet. Thus, the chromatography separator is upstream of the treatment channel. In this embodiment, the treating apparatus serves as a suppressor in an ion chromatography system, which removes the electrolyte of opposite charge to the analyte ions to be detected. Yager teaches a pretreatment system to purify the analyte. Thus, there would be no motivation in Yager to purify the liquid sample stream after chromatography separation since the contaminants in the liquid sample stream, which would interfere in the separation, would not be removed until after separation.

Claim 12 now recites detecting the one analyte species in the sample stream, not in the carrier stream. As set forth above, Yager detects the analyte ion species in the carrier liquid stream, not in the sample stream. Thus, for reasons set forth above, Yager teaches away from claim 12. Furthermore, Claim 12 further recites separating the sample stream and carrier stream exiting from the treatment channel prior to detecting. This further clarifies that the sample stream which is separated from the carrier stream is detected. For the foregoing reasons, Yager teaches in the opposite direction, which detects the carrier stream, but not the sample stream.

Claim 16 recites that the sample stream includes at least a first and second analyte ion species. The method further comprises separating such ion species prior to flowing the sample stream to the treatment channel inlet. For the foregoing reasons, Yager teaches a pretreatment system to purify the analyte ions from the contaminants in the sample stream. Thus, if ionic species were to be separated (e.g. by chromatography) with the purification method of Yager, the purification method would be performed upstream of separation to facilitate such separation, not downstream, as set forth in claim 16.

Claim 25 was indicated to be allowable rewritten in independent form. Claim 25 has now been written in independent form and, so, is submitted to be allowable.

Claims 1-10, 12-24, 26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rocklin (4,751,189) in view of Yager. The Office Action suggests that Rocklin is only missing from its disclosure a matrix ion species capture material in the carrier stream. This is incorrect. As discussed with the Examiner, Rocklin discloses a membrane suppressor in which the sample stream is separated from the carrier stream by an ion exchange membrane. This is illustrated, for example, in Figure 2 of Rocklin. Carrier streams flow in outside channels 28 while the sample stream flows in the central channel 26. The

sample stream is separated from the carrier liquid streams by membranes 27. In this instance, regenerant liquid is in the carrier stream in channel 28. The electrolyte ions of opposite charge to the sample analyte ion in the sample stream pass through the ion exchange membrane into the carrier liquid streams. The advantages of the system of the present invention in which such a membrane is excluded because the sample stream and carrier liquid stream form a liquid interface are illustrated at page 2, lines 8-14, of the present specification. Thus, for example, for a micro-scale conductivity suppressor it would be difficult to mass fabricate low-cost devices including such membranes due to sealing and fabrication issues. The present treating apparatus overcomes such disadvantages in a micro-scale device.

Rocklin does not suggest any reason for eliminating the membranes from the disclosed suppressor, which are essential to the suppressor disclosed in Rocklin. Yager does not suggest the use of a liquid interface to analyze the sample stream, but not the carrier stream. Instead, as set forth above, Yager teaches in the opposite direction.

Claims 9 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yager in view of Cais *et al.* (4,510,058). It is submitted that claims 9 and 21 distinguish from the prior art for reasons set forth above with respect to Yager regarding claims 1 and 12, respectively.

The Commissioner is authorized to charge fees which may be required, including extension fees, or credit any overpayment, to Deposit Account No. 50-0310.

Please direct any calls in connection with this application to the undersigned at (415) 442-1174.

Respectfully submitted,

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